

5.2.8)

$$a.) \quad A = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix} \quad C_2 = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \quad D = C_M A C_N^T \quad \therefore D = C_M A C_M$$

$$C_2 = \sqrt{\frac{2}{2}} \begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{bmatrix} = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

$$C_N^T = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} = C_2$$

$$A = C_M^T D C_N$$

$$A = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} 10 & -2 \\ -4 & 0 \end{bmatrix} \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

$$= \frac{1}{\sqrt{2}} \begin{bmatrix} 6 & -2 \\ 14 & -2 \end{bmatrix} \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

$$= \frac{1}{2} \begin{bmatrix} 4 & 8 \\ 12 & 16 \end{bmatrix} = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}$$

$$D = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \cdot \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix} \cdot \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

$$= \frac{1}{\sqrt{2}} \begin{bmatrix} 8 & 12 \\ -4 & -4 \end{bmatrix} \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

$$= \frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}} \begin{bmatrix} 20 & -4 \\ -8 & 0 \end{bmatrix}$$

$$= \frac{1}{2} \begin{bmatrix} 20 & -4 \\ -8 & 0 \end{bmatrix} = \begin{bmatrix} 10 & -2 \\ -4 & 0 \end{bmatrix}$$

$$D = \begin{bmatrix} 10 & -2 \\ -4 & 0 \end{bmatrix} \quad A = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}$$